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## THE VALLEY CITY GRABEN, UTAH<sup>1</sup>

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During the course of reconnaissance work undertaken in 1917 over much of southern Utah, the writer observed an interesting structure which seems worthy of a brief description. It is located in Townships 22 and 23 South, Ranges 19 and 20 East, in Grand County, and is plainly visible along the road between Thompsons and Moab, near Valley City.

### STRATIGRAPHY

The stratigraphy of the general region is simple, and is well described in reports by Lupton<sup>2</sup> and Woodruff,<sup>3</sup> to which the reader is referred for greater detail. The oldest formation exposed in the immediate vicinity is the Dolores, consisting of about 1,300 feet of variegated sandy shales and soft sandstones of Triassic age. Red, pink, and gray are the dominating colors. The formation is relatively nonresistant, and usually comprises plains and broad valleys. Above the Dolores occurs the La Plata sandstone, probably Jurassic in age. This is the most prominent formation in the district, and consists of two tan-colored, massive, highly cross-bedded sandstones separated by about 100 feet of red sandy shale. The sandstones are prominent cliff-makers and form the pronounced fault-line scarp near Court House Spring on the Thompsons-Moab road. Occasional lenses of unfossiliferous limestone a few feet thick and a few yards in extent were noted in the sandstone in places. Above the La Plata sandstone occurs the McElmo formation, of Jurassic age, consisting of about 1,000 to 1,200 feet

<sup>1</sup> Published by permission of Valerius, McNutt, and Hughes, Consulting Petroleum Geologists, Tulsa, Oklahoma.

<sup>2</sup> C. T. Lupton, "Oil and Gas near Green River, Grand County, Utah," *U.S. Geol. Survey, Bull.* 541 (1914), p. 115.

<sup>3</sup> E. G. Woodruff, "Geology of the San Juan Oil Field, Utah," *U.S. Geol. Survey, Bull.* 471 (1912), p. 76.

of shales and sandstones. No fossils were noted in this vicinity, but near Teasdale, in Wayne County, the writer found abundant marine fossils, chiefly pentagonal crinoid stems in a thin limestone, a few feet above the contact of this formation with the underlying massive sandstones. Fossils were also found at the same horizon near Loa. The McElmo beds are highly variegated, red, pink, gray, green, and maroon being common shades. Gypsum, in beds up to 100 feet or more thick, occurs in the lower half of the formation. About 400 feet below the top of the McElmo occurs the Salt Wash member, a very conglomeratic gray coarse sandstone. The McElmo has a highly characteristic bad-land topography. Following the McElmo occurs the Dakota formation of Cretaceous age, usually 25 or 30 feet thick, a coarse gray sandstone, at places highly conglomeratic and outcropping in hogbacks. Above the Dakota is the Mancos, a bluish-gray soft shale 2,000 to 3,000 feet thick, forming broad plains.

#### STRUCTURE

Lupton,<sup>1</sup> on his map of the Green River field, does not show the formations in the area involved in this description, but he writes the word "anticline" along the axis of the structure in question, leaving the area blank, since it was outside the field involved in his report. As seen from the west, along the Green River-Moab road or the Thompsons-Moab road (Fig. 1), the structure appears to be a simple anticline, the limbs of which rise gradually from the adjacent plain of Mancos shale to the northeast and southwest. Two scarps about a mile apart face each other from these limbs and overlook a central or axial valley which strikes about N. 45° W. At first this was supposed to be a simple anticlinal valley, but the extreme straightness of these scarps for several miles aroused suspicion, so a careful examination of the structure was made. It was found to be a well-developed anticline, along the crest of which occurs a typical graben or down-faulted trough about a mile wide (Fig. 2). The relationships are clearly brought out in Figs. 3 and 4. Outcrops of Mancos shale were found almost in contact with La Plata sandstone. This would give the fault a displacement of perhaps 1,200 feet or

<sup>1</sup> *Loc. cit.*



FIG. 1.—The Valley City anticline, seen from about three miles west of Valley City, Grand County, Utah.

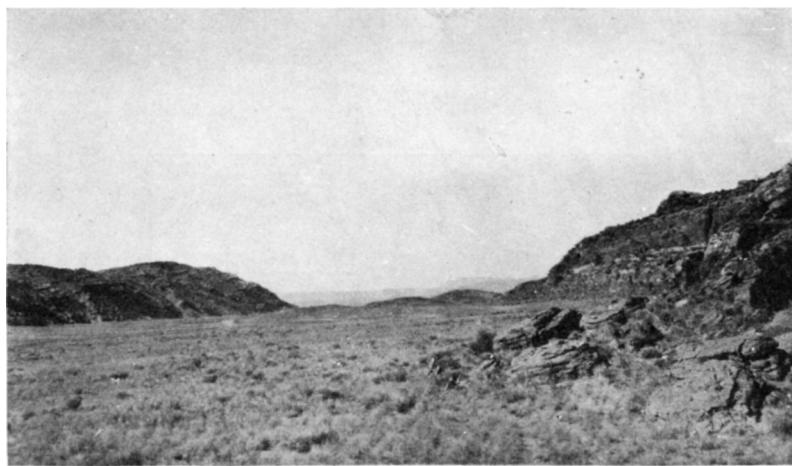


FIG. 2.—Within the graben of the Valley City anticline, Grand County, Utah. The walls on either side are fault-line scarps.

more. No fossils were found in the Mancos, but it is so highly characteristic in color and texture as to afford little doubt of its proper identification. Still farther southwest the graben seems to be floored with McElmo beds, probably the Salt Wash member,

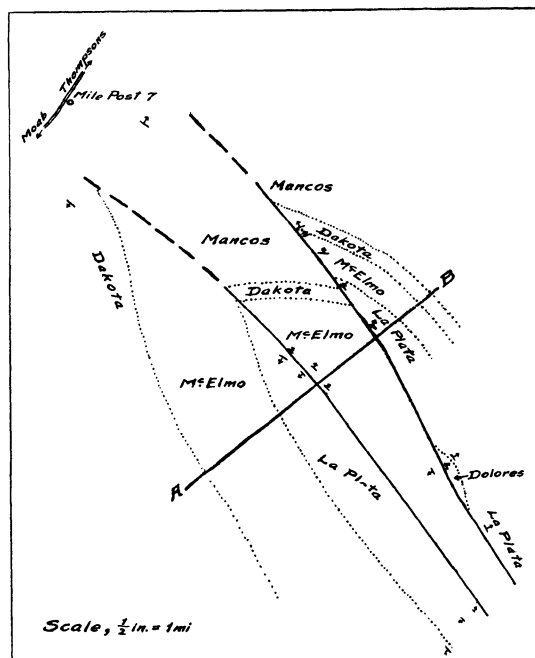


FIG. 3.—Map of portion of Valley City graben, Utah

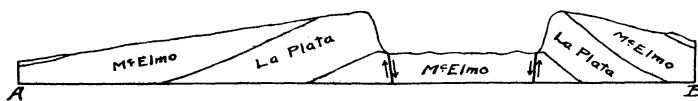


FIG. 4.—Section across Valley City graben, Utah

consisting of coarse gray conglomeratic sandstone. While it is possible that these beds are Dakota conglomerate, from their general character it seems much more probable that they are Salt Wash. They lie at the base of a well-pronounced fault-line scarp of La Plata sandstone several hundred feet high, along the base of which the Dolores is probably exposed. If so, this would involve about 2,000 feet of displacement.

Along the bottom of the graben plain, toward the base of the scarps on both sides, the beds show high local dips that are presumably the result of drag along the fault planes.

While the identification of the beds in the graben plain was wholly on lithologic grounds and was rendered somewhat difficult by scarcity of outcrop, there seems to be little doubt that the foregoing interpretation is the proper one. And while grabens are by no means rare, a graben occupying the axial line of a well-defined anticline seems sufficiently unusual to merit some attention. The area is probably complicated by cross-faulting. Since only one day was spent studying the structure, it is more than probable that important features escaped detection. The entire region is one that offers possibilities of interesting structural and stratigraphic work.

The topographic expression of this structure is clearly shown on the old United States Geological Survey La Sal Reconnaissance sheet, east of the road leading from the railroad to Moab. The two inward-facing scarps with the central valley and the outward dip slopes are plainly marked.

While no detailed work was done at Moab, the writer has seen some evidence to lead to the conclusion that the Moab plain, extending southeast from the village of Moab, is possibly also a similar graben.